Solutions to NEET Physics 2018

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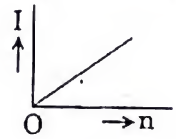
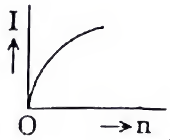
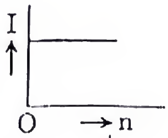
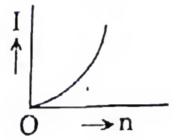
91. A battery consists of a variable number 'n' of identical cells (having internal resistance 'r' each) which are connected in series. The terminals of the battery are short-circuited and the current I is measured. Which of the graphs shows the correct relationship between I and n ?

(1) 

(2) 

(3) 

(4) 

91)

$$i = \frac{n\varepsilon}{n\varepsilon}$$

$\therefore$ I is Independent of n

option (3)

92. A carbon resistor of $(47 \pm 4{\cdot}7)$ kΩ is to be marked with rings of different colours for its identification. The colour code sequence will be

(1) Yellow – Violet – Orange – Silver

(2) Yellow – Green – Violet – Gold

(3) Violet – Yellow – Orange – Silver

(4) Green – Orange – Violet – Gold

92) 1st figure, 2nd figure, multiplier

$(47 \pm 4.7) \times 10^3$

Y V Orange

tolerance Silver

$\boxed{\text{Yellow violet - orange - Silver}}$

option (1)

93. A set of 'n' equal resistors, of value 'R' each, are connected in series to a battery of emf 'E' and internal resistance 'R'. The current drawn is I. Now, the 'n' resistors are connected in parallel to the same battery. Then the current drawn from battery becomes 10 I. The value of 'n' is

(1) 11

(2) 20

(3) 10

(4) 9

93) series

$$I = \frac{E}{R+nR} = \frac{E}{R(1+n)}$$

parallel

$$10I = \frac{n\varepsilon}{R+nR} = \frac{nE}{R(1+n)}$$

Parallel

$$10I = \frac{E}{R + \frac{R}{n}}$$

divide the ②

$$10\left[\frac{\cancel{E}}{\cancel{R(1+n)}}\right] = \frac{n\cancel{E}}{\cancel{R(1+n)}}$$

$n = 10$ — option (c)

94) $V \to +x$

$E \to +y$

$\therefore \boxed{B \to +z}$ — optn (1)

94. An em wave is propagating in a medium w[ith]
velocity $\vec{V} = V\hat{i}$. The instantaneous oscill[ating]
electric field of this em wave is along $+y$
Then the direction of oscillating magnetic fie[ld of]
the em wave will be along.

(1) $+z$ direction

(2) $-y$ direction

(3) $-z$ direction

(4) $-x$ direction

95) $U = \frac{1}{2} L I^2$

$25 \times 10^{-3} = \frac{1}{2} L \times (60 \times 10^{-3})^2$

$\boxed{L = 13.89 H}$ — optn (4)

95. The magnetic potential energy stored in a cer[tain]
inductor is 25 mJ, when the current in [the]
inductor is 60 mA. This inductor is of inducta[nce]

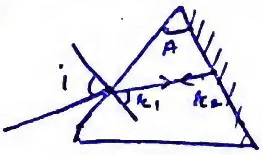
(1) 138·88 H

(2) 1·389 H

(3) 0·138 H

(4) 13·89 H

96) Ray will retrace its path if it falls normally on second surface. i.e $r_2 = 0$



$A = r_1 + r_2$

$\therefore A = r_1$ $[\because A = 30]$

$r_1 = 30$

$\mu = \frac{\sin i}{\sin r_1}$

$\sqrt{2} = \frac{\sin i}{\sin r_1} \Rightarrow \sin i = \sqrt{2} \times \frac{1}{2}$

$\sin i = \frac{1}{\sqrt{2}}$

or $\boxed{i = 45^\circ}$

optn (1)

96. The refractive index of the material of a pris[m is]
$\sqrt{2}$ and the angle of the prism is 30°. One of [the]
two refracting surfaces of the prism is mad[e a]
mirror inwards, by silver coating. A beam [of]
monochromatic light entering the prism from [the]
other face will retrace its path (after reflect[ion]
from the silvered surface) if its angle of incide[nce]
on the prism is

(1) 45°

(2) 30°

(3) 60°

(4) zero

$\mu = \sqrt{2}$

97) $u = -40$ cm

$f = -15$ cm

$\frac{1}{f} = \frac{1}{v_1} + \frac{1}{u}$

on solving $\boxed{V_1 = -24 cm}$

when object is displaced 20cm towards mir[ror]

$u = -20$ cm

$\frac{1}{f} = \frac{1}{V_2} + \frac{1}{u}$ $\boxed{V_2 = -60cm}$

97. An object is placed at a distance of 40 cm fro[m a]
concave mirror of focal length 15 cm. If the obj[ect]
is displaced through a distance of 20 cm towa[rds]
the mirror, the displacement of the image will [be]

(1) 36 cm away from the mirror

(2) 30 cm towards the mirror

(3) 30 cm away from the mirror

(4) 36 cm towards the mirror

[SPA]CE FOR ROUGH WORK Hindi/Engl[ish]

$\therefore$ displacement of image $= 60 - 24 = 36$cm away

98. An electron of mass m with an initial velocity $\vec{V} = V_0\,\hat{i}$ $(V_0 > 0)$ enters an electric field $\vec{E} = -E_0\,\hat{i}$ (E_0 = constant > 0) at t = 0. If λ_0 is its de-Broglie wavelength initially, then its de-Broglie wavelength at time t is

(1) $\lambda_0\left(1 + \frac{eE_0}{mV_0}t\right)$

(2) $\lambda_0 t$

(3) $\dfrac{\lambda_0}{\left(1 + \frac{eE_0}{mV_0}t\right)}$

(4) λ_0

98) $\longrightarrow \vec{V} = V_0 i$

$\longrightarrow \vec{E} = -E_0 \hat{i}$

$F = qE$

$F = -e(-E_0) = eE_0$

$ma = eE_0 \Rightarrow \boxed{a = \frac{eE_0}{m}}$

using $V = u + at$

$\boxed{V = V_0 + \frac{eE_0}{m} \cdot t}$

$\lambda = \frac{h}{mV} = \frac{h}{m\left[V_0 + \frac{eE_0}{m} \cdot t\right]}$

$\boxed{\lambda = \frac{h}{mV_0\left[1 + \frac{eE_0}{mV_0} \cdot t\right]}}$

λ_0 option (3)

99. When the light of frequency $2\nu_0$ (where ν_0 is threshold frequency), is incident on a metal plate, the maximum velocity of electrons emitted is v_1. When the frequency of the incident radiation is increased to $5\nu_0$, the maximum velocity of electrons emitted from the same plate is v_2. The ratio of v_1 to v_2 is

(1) 1 : 4

(2) 4 : 1

(3) 1 : 2

(4) 2 : 1

$2\nu_0$ v_1

$5\nu_0$

99) $\frac{1}{2}mv^2 = h\nu - \phi_0$ $\quad | \phi_0 = h\nu_0$

a) $\frac{1}{2}mv_1^2 = h(2\nu_0) - h\nu_0$

$\frac{1}{2}mv_1^2 = \boxed{h\nu_0}$

b) $\frac{1}{2}mV_2^2 = 5h\nu_0 - h\nu_0$

$= \boxed{4h\nu_0}$

$\frac{V_1^2}{V_2^2} = \frac{\cancel{h\nu_0}}{4\cancel{h\nu_0}} = \frac{1}{4}$

$\boxed{\frac{V_1}{V_2} = \frac{1}{2}}$ option (3)

100. The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is

(1) 1 : − 1

(2) 2 : − 1

(3) 1 : 1

(4) 1 : − 2

100) Total Energy = − K.E

$\therefore \boxed{\frac{T.E}{K.E} = -1}$ optn (1)

101. For a radioactive material, half-life is 10 minutes. If initially there are 600 number of nuclei, the time taken (in minutes) for the disintegration of 450 nuclei is

(1) 10

(2) 30

(3) 20

(4) 15

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101) $t_{1/2} = 10$ min

$N_0 = 600$

450 nuclei disintegrate

$\therefore$ Nuclei present $= 600 - 450 = 150$

$N = 150$

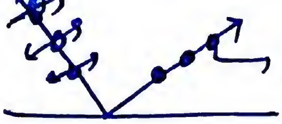
$n = \frac{t}{t_{1/2}}$

$\frac{N}{N_0} = \left(\frac{1}{2}\right)^n$

$\frac{1}{4} = \frac{1}{2^n}$

$n = 2$

$\boxed{t = 2 \times 10 = 20}$



102. Unpolarised light is incident from air on a pl surface of a material of refractive index 'μ'. particular angle of incidence 'i', it is found the reflected and refracted rays perpendicular to each other. Which of following options is correct for this situation?

(1) Reflected light is polarised with its ele vector perpendicular to the plane incidence

(2) $i = \sin^{-1}\left(\frac{1}{\mu}\right)$

(3) Reflected light is polarised with its ele vector parallel to the plane of incidence

(4) $i = \tan^{-1}\left(\frac{1}{\mu}\right)$

(102) when reflected & refracted light are ⊥ar to each other then reflected light is plane polarised light with its vector ~~parallel~~ perpendicular to plane of Incidence

& $\theta_p = \tan^{-1}(\mu)$.

∴ option ① correct

103. In Young's double slit experiment the separ d between the slits is 2 mm, the wavelengt the light used is 5896 Å and distance D bet the screen and slits is 100 cm. It is found tha angular width of the fringes is 0·20°. To inc the fringe angular width to 0·21° (with sa and D) the separation between the slits nee be changed to

(1) 1·9 mm

(2) 2·1 mm

(3) 1·8 mm

(4) 1·7 mm

103) $\theta = \frac{\lambda}{d} \Rightarrow \theta \propto \frac{1}{d}$

$\frac{\theta_1}{\theta_2} = \frac{d_2}{d_1}$

$\frac{0.20}{0.21} = \frac{d_2}{2} \Rightarrow d_2 = 2\left(\frac{0.20}{0.21}\right)$

$\boxed{d_2 = 1.9\,mm}$

option ①

104. An astronomical refracting telescope will large angular magnification and high ang resolution, when it has an objective lens of

(1) large focal length and small diameter

(2) large focal length and large diameter

(3) small focal length and large diameter

(4) small focal length and small diameter

104) for Large Magnification

$M = \frac{f_o}{f_e}$

$\boxed{f_o \text{ should be Large}}$

for Large resolution

$\theta = \frac{d_o}{1.22\lambda}$

$\boxed{\text{diameter should be Large}}$

Option (b)

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$L = 20\,mH = 20\times10^{-3}\,H$

105) $C = 100\,\mu F = 100\times10^{-6}\,F$

$R = 50\,\Omega$

$V = 10 \sin 314t$

$\omega = 314$

$V_0 = 10$

Impedance $= \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$

$= \sqrt{(50)^2 + \left(314\times 20\times10^{-3} - \frac{1}{314\times100\times10^{-6}}\right)^2}$

$Z = 56.15$

$I_0 = \frac{V_0}{Z} = \frac{10}{56.15} = 0.178\,A$

Power $= \frac{I_0}{\sqrt{2}} \times \frac{V_0}{\sqrt{2}} \times \cos\phi$ $\quad [\because P = I_{rms} V_{rms} \cos\phi]$

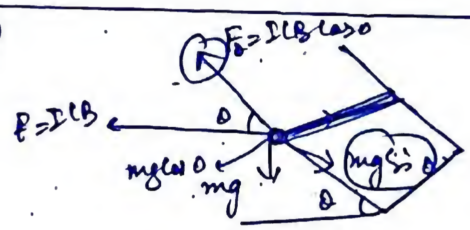
$\cos\phi = \frac{R}{Z}$

Power $= \frac{0.178\times10}{2} \times \frac{R}{Z}$

Power $= \frac{0.178\times10}{2} \times \frac{50}{56.15} = 0.79$ watt

option c

106)



For equilibrium

$ILB\cos\theta = mg\sin\theta$

$I = \frac{mg}{LB}\tan\theta$

option d

$I = \frac{0.5\times9.8}{0.25}\times\tan 30 = 11.32\,A$

107) $R = \frac{5\,\text{div}}{10^{-3}\,A \times \frac{20\,\text{div}}{V}} = \frac{5\,V}{10^{-3}\times20\,A}$

$R = \frac{5\times10^{3}}{20} = \frac{5\cancel{000}^{250}}{\cancel{20}} = 250\,\Omega$

option (2)

105. An inductor 20 mH, a capacitor 100 μF and a resistor 50 Ω are connected in series across a source of emf, $V = 10 \sin 314\,t$. The power loss in the circuit is

(1) 0·43 W

(2) 2·74 W

(3) 0·79 W

~~(4)~~ 1·13 W

106. A metallic rod of mass per unit length 0·5 kg m^{-1} is lying horizontally on a smooth inclined plane which makes an angle of 30° with the horizontal. The rod is not allowed to slide down by flowing a current through it when a magnetic field of induction 0·25 T is acting on it in the vertical direction. The current flowing in the rod to keep it stationary is

(1) 5·98 A

(2) 14·76 A

~~(3)~~ 7·14 A

(4) 11·32 A

107. Current sensitivity of a moving coil galvanometer is 5 div/mA and its voltage sensitivity (angular deflection per unit voltage applied) is 20 div/V. The resistance of the galvanometer is

(1) 25 Ω

(2) 250 Ω

(3) 40 Ω

(4) 500 Ω

108. A thin diamagnetic rod is placed vertically between the poles of an electromagnet. When the current in the electromagnet is switched on, then the diamagnetic rod is pushed up, out of the horizontal magnetic field. Hence the rod gains gravitational potential energy. The work required to do this comes from

(1) the magnetic field

(2) the lattice structure of the material of the rod

(3) the current source

(4) the induced electric field due to the changing magnetic field

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108) Current source must be there to lift the it up.

109) $l_1 = 20\,cm\ ;\ l_2 = 73\,cm$

$= 0.2\,m \qquad = 0.73\,m$

In resonance tube method

$V = 2(l_2 - l_1) \cdot \nu$

$V = 2(.73 - .20) \times 320$

$\boxed{V = 339\,m/s}$ — option ①

110) $a = \frac{qE}{m}$ $\qquad h = \frac{1}{2}\frac{qE}{m} \cdot t^2$

$t = \sqrt{\frac{2hm}{qE}}$ $\qquad t \propto \sqrt{m}$

$\therefore t_p > t_e$

∴ Time period of electron must be smaller

111) $\cancel{A = \omega\sqrt{a^2 + y^2}}$

$a = \omega^2 y$

$\cancel{20}\ 4 = \omega^2(\cancel{5})$

$\omega^2 = 4\ ;\ \omega = 2$

$\frac{2\pi}{T} = \cancel{2} \Rightarrow \boxed{T = \pi\,sec}$ option ①

112) $F = \frac{1}{2} Q \cdot E$

$F = \frac{1}{2} \cdot Q \times \frac{\sigma}{\varepsilon_0} \qquad \left(\sigma = \frac{Q}{A}\right)$

$F = \frac{1}{2}\frac{Q}{\varepsilon_0} \cdot \frac{Q}{A}$

$\boxed{F = \frac{1}{2}\frac{Q^2}{\varepsilon_0 A}}$ — F is independent of distance — option C

109. A tuning fork is used to produce resonance in glass tube. The length of the air column in the tube can be adjusted by a variable piston. At room temperature of 27°C two successive resonances are produced at 20 cm and 73 cm column length. If the frequency of the tuning fork is 320 Hz, the velocity of sound in air at 27°C is

(1) 339 m/s
(2) 350 m/s
(3) 330 m/s
(4) 300 m/s

110. An electron falls from rest through a vertical distance h in a uniform and vertically upward directed electric field E. The direction of electric field is now reversed, keeping its magnitude the same. A proton is allowed to fall from rest in it through the same vertical distance h. The time of fall of the electron, in comparison to the time of fall of the proton is

(1) 5 times greater
(2) 10 times greater
(3) smaller
(4) equal

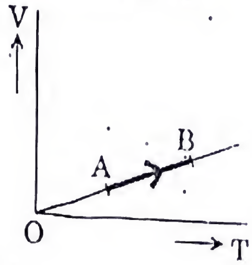
111. A pendulum is hung from the roof of a sufficiently high building and is moving freely to and fro like a simple harmonic oscillator. The acceleration of the bob of the pendulum is 20 m/s^2 at a distance of 5 m from the mean position. The time period of oscillation is

(1) π s
(2) 2 s
(3) 2π s
(4) 1 s

112. The electrostatic force between the metal plates of an isolated parallel plate capacitor C having a charge Q and area A, is

(1) linearly proportional to the distance between the plates.
(2) proportional to the square root of the distance between the plates.
(3) independent of the distance between the plates.
(4) inversely proportional to the distance between the plates.

113. The volume (V) of a monatomic gas varies with its temperature (T), as shown in the graph. The ratio of work done by the gas, to the heat absorbed by it, when it undergoes a change from state A to state B, is



(1) $\frac{2}{3}$

(2) $\frac{1}{3}$

(3) $\frac{2}{5}$

(4) $\frac{2}{7}$

113) $dQ = nC_p\, dT$

$dQ = n \times \frac{5}{2} R\, dT$

$dw = n R\, dT$

$\frac{dQ}{dw} = \frac{\cancel{n}\frac{5}{2} \times \cancel{R}\cancel{dT}}{\cancel{n}\cancel{R}\cancel{dT}}$

$\frac{dQ}{dw} = \frac{5}{2}$ or $\boxed{\frac{dw}{dQ} = \frac{2}{5}}$

option c

114. The efficiency of an ideal heat engine working between the freezing point and boiling point of water, is

(1) 20%
(2) 6·25%
(3) 26·8%
(4) 12·5%

114) $T_1 = 0°C = 273K.$
$T_2 = 100°C = 373K.$

$\eta = \left(1 - \frac{T_1}{T_2}\right) \times 100 = \left(1 - \frac{273}{373}\right) \times 100$
$= 26.8\%$ option (c)

115. At what temperature will the rms speed of oxygen molecules become just sufficient for escaping from the Earth's atmosphere ?
(Given :
Mass of oxygen molecule (m) = $2{\cdot}76 \times 10^{-26}$ kg
Boltzmann's constant $k_B = 1{\cdot}38 \times 10^{-23}$ J K^{-1})

(1) $8{\cdot}360 \times 10^4$ K
(2) $5{\cdot}016 \times 10^4$ K
(3) $2{\cdot}508 \times 10^4$ K
(4) $1{\cdot}254 \times 10^4$ K

115) $V = 11.2 \times 10^3$ m/s.

$\sqrt{\frac{3k_B T}{m_{O_2}}} = 11.2 \times 10^3$

on Solving

$T = 8.360 \times 10^4 K.$

option (1)

116. The fundamental frequency in an open organ pipe is equal to the third harmonic of a closed organ pipe. If the length of the closed organ pipe is 20 cm, the length of the open organ pipe is

(1) 8 cm
(2) 12·5 cm
(3) 13·2 cm
(4) 16 cm

116) Fundamental frequency of open organ pipe $= \frac{V}{2L_o}$

Third Harmonic of closed pipe $= 3\frac{V}{4L_c}$

$\frac{\cancel{V}}{\cancel{2}L_o} = 3\frac{\cancel{V}}{{}_2\cancel{4}L_c}$

$L_o = \frac{2L_c}{3}$

$L_o = 2\left(\frac{20}{3}\right) = 13.3$ cm

option c

(17) $Y = \frac{\text{Stress}}{\text{Strain}} = \frac{F}{A\,(\text{strain})}$.

$Y \times \text{Strain} = \frac{F}{A} \Rightarrow Y \cdot \frac{\Delta l}{l} = \frac{F}{A}$

Since wires have same material & same extension ∴ $Y \times \frac{\Delta l}{\cancel{\text{Stress}}}$ is Const

∴ $\frac{F_1 l_1}{A_1} = \frac{F_2 l_2}{A_2}$

$\left[\begin{array}{l} A_1 l_1 = A_2 l_2 \\ A \cdot l_1 = 3A\, l_2 \\ l_1 = 3 l_2 \end{array}\right]$

$\frac{F_1 l_1}{A} = \frac{F_2}{3A} \times l_2$

$F_1 l_1 = \frac{F_2 l_2}{3}$

$F \times 3\cancel{l_2} = \frac{F_2 \times \cancel{l_2}}{3}$

$\boxed{F_2 = 9F}$ — option (c)

118) $\Delta Q = \Delta U + \Delta W$

$54 \times 4.18 = \Delta U + 1.013 \times 10^5 (167.1 \times 10^{-6} - 0)$

$\boxed{\Delta U = 208.7\,J}$ — option (1)

119) Wien's Law $T \propto \frac{1}{\lambda_m}$

$T \propto \frac{1}{3/4}$ $\quad T \propto \frac{4}{3}$

∴ Power radiat $\propto T^4$

$= \left(\frac{4}{3}\right)^4 = \frac{256}{81}$ option (2)

120) $\frac{dQ}{dt}$ = force × veloc $= 6\pi\eta r V \times V$

Power $\propto V^2 \times r$, $V \propto r^2$

∴ $P \propto r^4 \cdot r$

$\boxed{P \propto r^5}$

117. Two wires are made of the same material a have the same volume. The first wire h cross-sectional area A and the second wire h cross-sectional area 3A. If the length of the fi wire is increased by Δl on applying a force how much force is needed to stretch the seco wire by the same amount ?

(1) 6 F
(2) 4 F
(3) 9 F
(4) F

118. A sample of 0·1 g of water at 100°C and norm pressure ($1{\cdot}013 \times 10^5$ Nm^{-2}) requires 54 cal heat energy to convert to steam at 100°C. If th volume of the steam produced is 167·1 cc, th change in internal energy of the sample, is

(1) 208·7 J
(2) 42·2 J
(3) 104·3 J
(4) 84·5 J

119. The power radiated by a black body is P and i radiates maximum energy at wavelength, λ_0. I the temperature of the black body is now changed so that it radiates maximum energy a wavelength $\frac{3}{4}\lambda_0$, the power radiated by i becomes nP. The value of n is

(1) $\frac{4}{3}$
(2) $\frac{256}{81}$
(3) $\frac{3}{4}$
(4) $\frac{81}{256}$

120. A small sphere of radius 'r' falls from rest in a viscous liquid. As a result, heat is produced du to viscous force. The rate of production of hea when the sphere attains its terminal velocity, i proportional to

(1) r^2
(2) r^5
(3) r^3
(4) r^4

121) Question Solved in figure

$\therefore Y = (A\cdot\bar{B} + \bar{A}\cdot B)$

option (1)

122) $I_B = \dfrac{20}{500\cdot10^3} = 40\,\mu A$

$I_c = \dfrac{20}{4\cdot10^3} = 5\,mA$

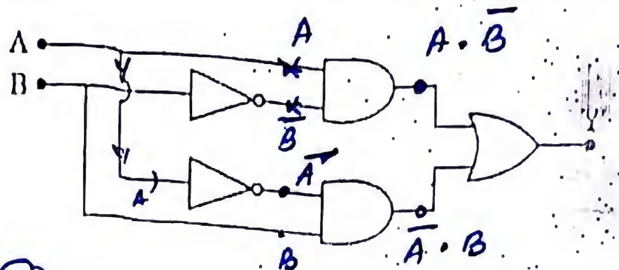
$\beta = \dfrac{5\times10^{-3}}{40\cdot10^{-6}} = 125$

option (4)

123) Both holes & electrons are created

$\therefore$ it affects overall Characteristics

121. In the combination of the following gates the output Y can be written in terms of inputs A and B as



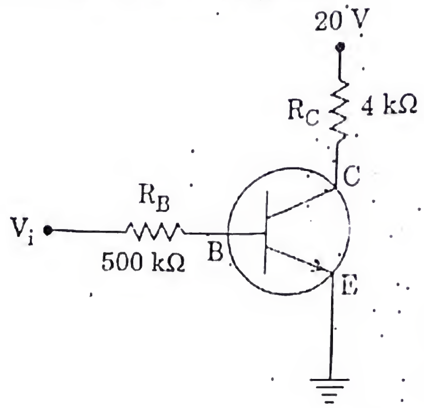
(1) $A\cdot\bar{B} + \bar{A}\cdot B$

(2) $\overline{A\cdot B} + A\cdot B$

(3) $\overline{A\cdot B}$

(4) $\overline{A+B}$

122. In the circuit shown in the figure, the input voltage V_i is 20 V, $V_{BE} = 0$ and $V_{CE} = 0$. The values of I_B, I_C and β are given by



(1) $I_B = 25\ \mu A$, $I_C = 5$ mA, $\beta = 200$

(2) $I_B = 20\ \mu A$, $I_C = 5$ mA, $\beta = 250$

(3) $I_B = 40\ \mu A$, $I_C = 10$ mA, $\beta = 250$

(4) $I_B = 40\ \mu A$, $I_C = 5$ mA, $\beta = 125$

123. In a p-n junction diode, change in temperature due to heating

(1) affects only forward resistance

(2) does not affect resistance of p-n junction

(3) affects only reverse resistance

(4) affects the overall V – I characteristics of p-n junction

124) from Keplers Second Law of planetary motion
when planet is nearer to Sun
it velocity is more.

∴ $V_A > V_B > V_C$.

∴ $\boxed{K_A > K_B > K_C}$ — option (1)

125) $K_T = \frac{1}{2} mv^2$

$K_T + K_R = \frac{1}{2} mv^2 + \frac{1}{2} I\omega^2 = \frac{1}{2} mv^2 + \frac{1}{2} I \cdot \frac{v^2}{R^2}$

∴ $\frac{K_T}{K_T + K_R} = \frac{\frac{1}{2} mv^2}{\frac{1}{2} mv^2 + \frac{1}{2} I \frac{v^2}{R^2}}$ [for sphere $I = \frac{2}{5} MR^2$].

$= \frac{\frac{1}{2} mv^2}{\frac{1}{2} mv^2 + \frac{1}{\cancel{2}} \cdot \frac{\cancel{2}}{5} M\cancel{R^2} \cdot \frac{v^2}{\cancel{R^2}}} = \frac{\frac{1}{2}}{\frac{1}{2} + \frac{1}{5}}$

$= \frac{1}{\cancel{2}} \times \frac{\cancel{10}\,5}{7} = \frac{5}{7}$ — option (1)

Q126) $g = \frac{GM}{R^2}$ $g \propto G$

∴ g will change.

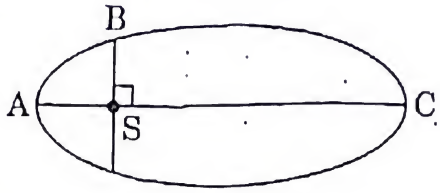
∴ option (4) is incorrect

Q(127) As per Law of Conservation of Angular Momentum

L = constant

∴ option (4)

124. The kinetic energies of a planet in ar orbit about the Sun, at positions A, B K_A, K_B and K_C, respectively. AC is axis and SB is perpendicular to A position of the Sun S as shown in t Then



(1) $K_A > K_B > K_C$

(2) $K_B < K_A < K_C$

(3) $K_A < K_B < K_C$

(4) $K_B > K_A > K_C$

125. A solid sphere is in rolling motion. I motion a body possesses translationa energy (K_t) as well as rotational kineti (K_r) simultaneously. The ratio K_t : (K_t the sphere is

(1) 5 : 7

(2) 10 : 7

(3) 7 : 10

(4) 2 : 5

126. If the mass of the Sun were ten times and the universal gravitational consta ten times larger in magnitude, which following is *not* correct ?

(1) Walking on the ground would becor difficult.

(2) Time period of a simple pendulum Earth would decrease.

(3) Raindrops will fall faster.

(4) 'g' on the Earth will not change.

127. A solid sphere is rotating freely ab symmetry axis in free space. The radius sphere is increased keeping its mass Which of the following physical quantities remain constant for the sphere ?

(1) Moment of inertia

(2) Rotational kinetic energy

(3) Angular velocity

(4) Angular momentum

128) $\vec{F} = (4\hat{i}+5\hat{j}-6\hat{k})$

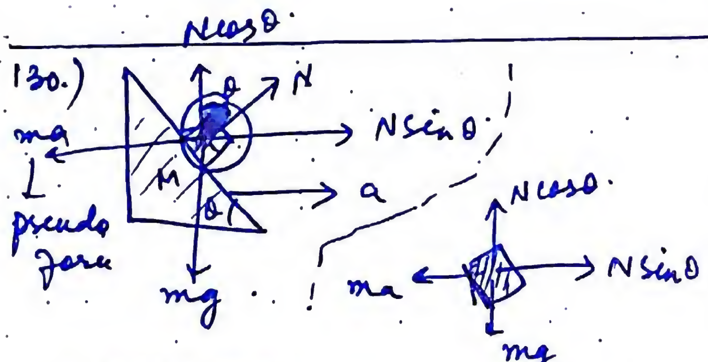
$\vec{r} = \vec{r}_2-\vec{r}_1 = (2\hat{i}+0\hat{j}-3\hat{k}) - [2\hat{i}-2\hat{j}-2\hat{k}]$

$\vec{r} = 0\hat{i}+2\hat{j}-\hat{k}$

$\vec{\tau} = \vec{r}\times\vec{F} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k}\\ 0 & 2 & -1\\ 4 & 5 & -6\end{vmatrix}$

$\boxed{\vec{\tau} = -7\hat{i}-4\hat{j}-8\hat{k}}$ (Ans) 4

130.)



$N\cos\theta = mg$

$N\sin\theta = ma$

dividing $\tan\theta = \frac{a}{g}$ or $\boxed{a = g\tan\theta}$

option 4

131) diameter = M.S.R + Circular scale × L.C

diameter = $5 + 25 \times .01$

$= 5.25$ mm

Actual dia = 5.25 − zero error

$= 5.25 - (-0.04)$ mm

$= 5.29$ mm

$\boxed{= 0.529\text{ cm}}$

... moment of the force, $\vec{F} = 4\hat{i}+5\hat{j}-6\hat{k}$ at (2, 0, − 3), about the point (2, − 2, − 2), is given by

(1) $-4\hat{i}-\hat{j}-8\hat{k}$

(2) $-7\hat{i}-8\hat{j}-4\hat{k}$

(3) $-8\hat{i}-4\hat{j}-7\hat{k}$

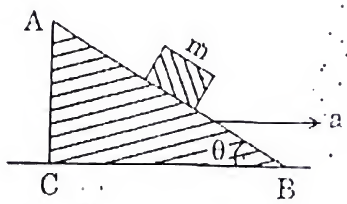
(4) $-7\hat{i}-4\hat{j}-8\hat{k}$

6 m/s

129. A toy car with charge q moves on a frictionless horizontal plane surface under the influence of a uniform electric field $\vec{E}$. Due to the force $q\vec{E}$, its velocity increases from 0 to 6 m/s in one second duration. At that instant the direction of the field is reversed. The car continues to move for two more seconds under the influence of this field. The average velocity and the average speed of the toy car between 0 to 3 seconds are respectively

(1) 1 m/s, 3 m/s
(2) 1 m/s, 3·5 m/s
(3) 2 m/s, 4 m/s
(4) 1·5 m/s, 3 m/s

130. A block of mass m is placed on a smooth inclined wedge ABC of inclination θ as shown in the figure. The wedge is given an acceleration 'a' towards the right. The relation between a and θ for the block to remain stationary on the wedge is



(1) $a = \frac{g}{\sin\theta}$

(2) $a = g\cos\theta$

(3) $a = \frac{g}{\text{cosec}\,\theta}$

(4) $a = g\tan\theta$

131. A student measured the diameter of a small steel ball using a screw gauge of least count 0·001 cm. The main scale reading is 5 mm and zero of circular scale division coincides with 25 divisions above the reference level. If screw gauge has a zero error of − 0·004 cm, the correct diameter of the ball is

(1) 0·525 cm
(2) 0·053 cm
(3) 0·521 cm
(4) 0·529 cm

0.001
5mm

132. Three objects, A : (a solid sphere), B : (a thin circular disk) and C : (a circular ring), each having the same mass M and radius R. They all spin with the same angular speed ω about their own symmetry axes. The amounts of work (W) required to bring them to rest, would satisfy the relation

(1) $W_A > W_B > W_C$

(2) $W_B > W_A > W_C$

(3) $W_C > W_B > W_A$

(4) $W_A > W_C > W_B$

Q132) Work done = change in K.E.

$W = \frac{1}{2} I \omega^2$

$W \propto I$

$I_A = \frac{2}{5} MR^2$

$I_B = \frac{1}{2} MR^2$

$I_C = MR^2$

$I_C > I_B > I_A$

$\therefore W_C > W_B > W_A$

opt. c.

133. A moving block having mass m, collides with another stationary block having mass 4m. The lighter block comes to rest after collision. When the initial velocity of the lighter block is v, then the value of coefficient of restitution (e) will be

(1) 0·25

(2) 0·8

(3) 0·5

(4) 0·4

133.

m, 4m → m, 4m

$u_1 = \vec{V}$, $u_2 = 0$, $V_1 = 0$

velocity of lighter body after collision ($V_1 = 0$)

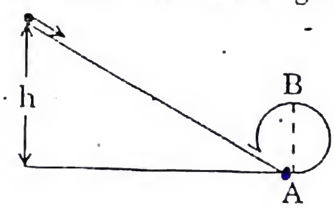
$$V_1 = \frac{(m_1 - e m_2) u_1}{m_1 + m_2} + \frac{(1+e) m_2 u_2}{m_1 + m_2} \quad \{u_2 = 0\}$$

$$0 = \left(\frac{m - e(4m)}{5m}\right) V + 0$$

on solving

Ans. $\boxed{e = \frac{1}{4} = 0.25}$

134. A body initially at rest and sliding along a frictionless track from a height h (as shown in the figure) just completes a vertical circle of diameter AB = D. The height h is equal to



(1) D

(2) $\frac{7}{5}$ D

(3) $\frac{3}{2}$ D

(4) $\frac{5}{4}$ D

134) when body falls through h

velocity at A = $V_A = \sqrt{2gh}$ —(1)

for looping the loop $V_A = \sqrt{5gR}$ —(2)

from (1) & (2)

$h = \frac{5R}{2} = \boxed{\frac{5D}{4}}$ — opt. (d)

135. Which one of the following statements is *incorrect* ?

(1) Limiting value of static friction is directly proportional to normal reaction.

(2) Frictional force opposes the relative motion.

(3) Rolling friction is smaller than sliding friction.

(4) Coefficient of sliding friction has dimensions of length.

135) Coefficient of sliding friction is a dimensionless quantity.

$\therefore$ (4) option is correct.